GENERAL INDEX TO VOL. IX.

[NOTE.—Authors' and Debaters' Names in SMALL CAPS; Titles of Papers in *italics.*]

PAGE

Abrasion of stern bearings..... 661
Accelerations in nozzles..... 505
Air in driven wells..... 328
Allen's Anti-lamina for steam boilers..... 254
ALMOND, T. R., disc., piston packing..... 94
" " " steel car axles..... 151
Analyses of chilling irons..... 339
Annealing of steel.....150, 723
Annealing of steel castings..... 344
Anthony's chronograph..... 379
Anthracite and bituminous coal burning engines..... 631
Appold fan..... 231
Arnot's thermometer stove..... 436
ASHWORTH, DANIEL, disc., experiments with blowers..... 63
" " " piston packing..... 96
Automatic regulator for heating apparatus..... 431
Axles, car, of steel..... 135

BABCOCK, GEORGE H., President's address, 1887..... 23
" " " disc., a safety car heating system..... 462
" " " " automatic regulators for heating apparatus... 436
" " " " driven wells..... 329
" " " " kerosene oil in steam boilers..... 257
" " " " piston packing..... 96
" " " " proportioning steam cylinders..... 365
" " " " shaft governor..... 311
" " " " soft castings..... 338
" " " " steel car axles..... 160
Babcock and Wilcox governor..... 313
Babcock's governor..... 312
Badges, uniformity in..... 9
Balanced valves, leakage of.....614, 644
BALDWIN, S. W., disc., strains in locomotive boilers..... 540
BALDWIN, W. J., Notes on warming railroad cars by steam..... 471
Ball bearings..... 330
BALL, FRANK H., An improved form of shaft governor..... 300
" " " disc., piston packing..... 94
Ballast for railroads..... 279
Ballast unloader..... 527
Band saws, punching of..... 730
Banister, George, alloys for tempering steel..... 725
BARR, W. M., disc., driven wells..... 329

PAGE

BARRUS, G. H., An electric speed recorder..... 377
" " Memoranda on the performance of a compound engine..... 545
" " The effect of circulation in steam boilers, on the quality of steam..... 489
" " disc., duty trials of pumping engines..... 483
" " " economy of high and low speed engines..... 712
" " " Strong locomotive..... 611
BARTOL, B. H., memorial notice of..... 737
Belpaire fire box..... 538
Best form of nozzles and diverging tubes..... 505
BILGRAM, HUGO, di-c., centrifugal pumps..... 281
" " " fit of set screws..... 334
" " " friction in toothed gearing..... 215
" " " shaft governor..... 316
BINSSE, HENRY LEON, A short way to keep time and cost..... 380
Blades for centrifugal pumps..... 242
Blowers, Experiments and Experiences with..... 51
Blowers, automatic adjustment of..... 68
Blowers, profile of blade for..... 69
Blowers, repairs of..... 66
Blue prints large and enlarged..... 696
Boilers, strains in locomotive..... 534
Boilers, circulation in..... 489
Boilers, use of kerosene oil in..... 247
BOND, G. M., disc., inserting and securing crank pins..... 449
" " " river practice of the West..... 659
" " " rope transmissions..... 710
Brake straps, lining for..... 331
Brass, deterioration of..... 429
Bridge structures, A railroad bed for..... 276
BRIGGS, J. G., disc., driven wells..... 324
Brownlee's tubes..... 570
Buckeye governor..... 305

Cams for Western river engines..... 655
Capacity of Strong locomotive..... 564
Car axles, steel..... 135
Carbon, in steel..... 136
Carbon, non-hardening..... 137
Car heating, a safety system for..... 453
Castings toughened, or stirling..... 341
Cast iron, softness of..... 337
Cement, influence of sugar upon..... 286
Cements, testing of strength of..... 172
Centrifugal pumps and their efficiencies..... 228
Chernoff's theory of structure of steel..... 148
Circulation in steam boilers..... 489
Cleaves, E. C., method for blue printing..... 696
CLEMENTS, W. L., Steam Excavators..... 515
Coal used by Strong engine..... 608

PAGE
Coal, new method of stocking ... 270
COBB, E. S., disc., a plea for the printing press in engineering schools ... 409
" " " electro-plating of steel ... 716
" " " performance of a compound engine ... 549
" " " punched and sheared edges of steel ... 732
COFFIN, JOHN, Steel car axles ... 135
" " disc., power press problems ... 167
" " " standard section lining ... 119
Cohesion of fractured steel ... 155
Coke consumption in cupolas ... 502
COLE, J. W., disc., tempering of steel ... 724
COLLINS, C. C, A new method for inserting and securing crank pins ... 446
Compound engine, economy of ... 548
Compound engine, memoranda on the performance of a ... 545
Compound engines on Western rivers ... 654
Condensers, surface ... 417
Compression in Strong locomotive ... 562
Conductivity of metals for heat ... 419
Connecting rods ... 466
Contamination of driven wells ... 329
Conveyors for coal ... 270
COON, J. S., Duty trials of pumping engines ... 476
" " disc., circulation in steam boilers ... 492
" " " performance of a compound engine ... 548
" " " punched and sheared edges of steel ... 733
" " " Strong locomotive ... 630
" " " surface condensers ... 430
COOPER, J. H., disc., fit of set screws ... 333
" " " kerosene oil in steam boilers ... 254
" " " lining for brake straps ... 332
" " " punched and sheared edges of steel ... 730
" " " rope transmissions ... 703
" " " standard section lining ... 117
Copper tubes for condensers ... 429
Corrosion by electro-plating solutions ... 719
" " sugar vapor ... 429
" in fire boxes ... 536
" of gauge glasses ... 250
Cost and time, a short way to keep ... 380
" *of foundry work, estimating the* ... 390
" " steam excavator ... 532
Counter-weighting by steam ... 167
CRANE, T. S., disc., experiments with blowers ... 70
" " " power press problems ... 167
Crank pins, a new method for inserting and securing ... 446
Crank shafts, milling machine for ... 267
Crystallization of iron ... 538
Cupola experience, a foundry ... 496
Cupola process for soft castings ... 338
Cut-off in compound engine ... 549

PAGE

Cylinder of S. S. *Rip Van Winkle*, wear of 96
Cylinders, proportioning of 360
" unequal wear of 94
" " lubrication of 95

Dash-pot for clutches 171
" " governors 304
DAVIDSON'S viscosimeter 371
DAVIS, E. F. C., disc., divergencies in flange diameters 132
" " " shaft governors 318
" " " soft castings 338
" " " stocking and reloading coal 273
" " " wrought iron scrap in castings 341
DEAN, F. W., The distribution of steam in the Strong locomotive 556
DENT, E. L., disc., automatic regulator for heating apparatus 438
DENTON, J. E., The mechanical significance of viscosity determinations of lubricants 369
" " disc., a railroad bed for bridge structures 284
" " " centrifugal pumps 243
" " " experiments with blowers 65
" " " friction in toothed gearing 222
" " " friction of engines 84
" " " kerosene oil in steam boilers 255
" " " shaft governors 313
" " " standard section lining 121
" " " steel car axles 149
" " " the influence of sugar upon cement 291
" " " the milling machine as a substitute for the planer 265
" " " testing the strength of cements 181
DINGEE, W. W., disc., estimating the cost of foundry work 395
" " " rope transmissions 707
" " " repeated bending of steel 727
Displacement and area curves of fish 679
Distribution of steam by link motion 638
Distribution of steam in the Strong locomotive 556
Divergencies in flange diameters of pumps, valves, etc. 124
Diverging tubes and nozzles, best form of 505
Divine, James, on rope transmissions 704
DOANE, W. H., disc., fit of set screws 334
DODGE, JAMES M., A new method of stocking and reloading coal 270
Draft of pumps for driven wells 327
Driven wells 324
" " in clay 328
Drop test for car axles 150
Duty trials of pumping engines 476
DURFEE, W. F., disc., the milling machine as a substitute for the planer 267
Dynamometer, floating 214
" governor 303

Ebullition in steam boilers 492
" of greasy water 255

PAGE
Economy of high and low speed engines . . . 712
" of locomotives . . . 613
Economical method of heating and ventilating an office and warehouse building. 99
Effect of circulation in steam boilers on the quality of steam . . . 489
" " electro-plating on steel . . . 715
Efficiencies of centrifugal pumps . . . 228
Efficiency of a train of gears . . . 203
" " steam excavator . . . 530
Electric speed recorder, an . . . 377
Electro plating of steel, effect of . . . 715
EMERY, C. E., An interesting indicator diagram . . . 293
ENGEL, L. G., disc., divergencies in flange diameters . . . 130
" " " fit of set screws . . . 334
" " " kerosene oil in steam boilers . . . 255
" " " surface condensers . . . 429
" " " the influence of sugar upon cement . . . 291
Estimating the cost of foundry work . . . 390
Eucalyptus extract for scale in boilers . . . 254
Evaporative performances B. & A. engines . . . 628
Excavators, Steam . . . 515
Excursions, Philadelphia meeting . . . 21
" Nashville " . . . 358
Expansion of steel in hardening . . . 726
Experiments and Experiences with Blowers . . . 51

FALKENAU, ARTHUR, disc., fit of set screws . . . 336
FAWCETT, EZRA, disc., large blue prints . . . 700
" " " inserting and securing crank pins . . . 447
Feed motions . . . 167
FELTON, EDGAR C., Notes on steel tested shortly after rolling . . . 38
" " disc., experiments with blowers . . . 68
Fibrous iron, cause of . . . 541
Fish, displacements and area curves of . . . 679
Flange diameters, divergencies in . . . 124
Flanges for copper pipe . . . 129, 715
Flexible hulls for vessels . . . 646–659
Flexure combined with tension . . . 540
Fluid governors . . . 309
Flying extensions for coal conveyors . . . 270
Formulæ for condensing areas . . . 421
Foundry work, estimating the cost of . . . 390
Foundry cupola experience . . . 496
FOWLER, GEORGE L., Estimating the cost of foundry work . . . 390
Francis' tubes . . . 510
Freezing in hot water systems . . . 439
Friction gear . . . 715
" in governors . . . 315
" *in toothed gearing* . . . 185
" of engines . . . 74
" of engines at different cut-offs . . . 82

PAGE
Friction of pistons 87
" of pumps 481
Furnace for axles, Cambria iron works 139

GALE, H. B., disc., circulation in steam boilers 492
" " " electro-plating of steel 716
" " " performance of a compound engine 548
Gas fuel for car heating 461
Gearing, friction of 185
Gear tooth, a persistent form of 398
German shrinkage allowance 451
GOBEILLE, J. L., disc., a foundry cupola experience 502
" " " a plea for the printing press in engineering schools .. 410
" " " a safety car heating system 464
" " " automatic regulator for heating apparatus 440
Gold's storage heater for cars 473
Governor, an improved form of 300
GRANT, J. J., the milling machine as a substitute for the planer in machine construction 259
" " disc., power press problems 166
" " " standa d section lining 116
Graphical viscosimeter 375
Guidé rolling of steel 39

HALL, A. F., disc., large blue prints 699
Hall's condenser 417
HALSEY, F. A., disc., standard section lining 118
Hand rolling of steel 39
HANSCOM, W. W., memorial notice of 737
HAWKINS, J. T., A plea for the printing press in mechan cal engineering schools 403
" " Automatic regu'ator for heating apparatus 431
" " disc., duty trials of pumping engines 485
" " " electro-plating of steel 718
" " " estimating the cost of foundry work 396
" " " friction in toothed gearing 223
" " " inserting and securing crank pins 447
" " " molecular strains in steel 723
" " " punched and sheared edges of steel 727
" " " shaft governors 309
" " " steel car axles 152
" " " strains in locomotive boilers 540
" " " the milling machine as a substitute for the planer .. 267
" " " viscosity determinations of lubricants 376
" " " wire rope fastenings 677
Heating, a safety system for cars 453
Heater, Gold's storage 473
Heating and ventilating an office building 99
Heating apparatus, automatic regulator for 431

PAGE

HENNEY, J. B., disc., steel car axles 146
HEWITT, WILLIAM, wire rope fastenings 671
" " disc., steel car axles 147
" " " structure of steel 47
High and low speed engines, economy of 712
HOLLOWAY, J. F., disc., river practice of the West 664
Hunting of governors 302
HUSTON, C. L., disc., circulation in steam boilers 494
" " " punched and sheared edges of steel 731
HUTTON, F. R., disc., a plea for the printing press in engineering schools .. 409
" " " a safety car heating system 463
" " " a short way to keep time and cost 386
" " " driven wells 327
" " " duty trials of pumping engines 486
" " " electro-plating of steel 720
" " " inserting and securing crank pins 448
" " " standard section lining 113

Ide governor 306
Improved form of shaft governor, An 300
Indicator cards, Strong locomotive 563
Indicator cards, B. & A. engine 590
" " C. R. R. of N. J. engine 592
" " D., L. & W. " 568
" " L. B. & S. C. " 594
Indicator diagram, An interesting 293
Inertia of steam in pipes 298
Influence of sugar upon cement 286
Injured metal of punched or sheared edges 727
Inserted cutters for milling machines 265
Interesting indicator diagram, An 293
Internal friction in non-condensing engines 74
Investigation as to how to test the strength of cements 172
Involute cutters for milling machines 269
Isochronism of governors 313

Joints for flanged pipe 252
Joule's experiments with surface condenser 419
Journal bronzes 147
Journals for Lick telescope 330

KENT, WILLIAM, disc., a plea for the printing press in engineering schools ... 408
" " " a safety car heating system 464
" " " automatic regulator for heating apparatus 439
" " " divergencies in flange diameters 131
" " " duty trials of pumping engines 487
" " " electro-plating of steel 718
" " " friction of engines 89
" " " inserting and securing crank pins 450
" " " punched and sheared edges of steel 731
" " " river practice of the West 656

PAGE

KENT, WILLIAM, disc., standard section lining 121
" " " strains in locomotive boilers 538
" " " wrought iron scrap in castings 341
Kerosene in steam boilers 247
KERR, W. C., disc., shaft governors 315

LADD, J. B., disc., standard section lining 121
" " " shaft governors 319
LANPHEAR, O. A., disc., molecular strains in steel 722
" " " rope transmissions 710
LANZA, GAETANO, friction in toothed gearing 185
" " disc., testing the strength of cements 181
Large and enlarged photographs and blue prints 696
LEAVITT, E. D. disc., lining for brake straps 331
" " " wrought iron scrap in castings 341
LE VAN, W. B., disc., heating and ventilating a building 105
" " " divergencies in flange diameters 130
Level of water in a boiler 493
LEWIS, WILFRED, disc., friction in toothed gearing 217
" " " power press problems 167
Library, donations to 13
LIVERMORE, C. W., disc., river practice of the West 661
Locomotive boilers, Strains in 534
Locomotive engine performance 602
Locomotives, head resistance from air 633
Locomotive, Strong, Distribution of steam in 556
Lubricants, Significance of vicosity of 369
LYNE, LEWIS F., The use of kerosene oil in steam boilers 247
" " " disc., shaft governors 317
" " " " fit of set screws 333

Mapes' experiment on cohesion of metals 156
MAGRUDER, W. T., disc., a plea for the printing press in engineering schools 410
Marine engines, proportions of 367
Marine governor 311
MATTES W. F., connecting rods 466
" " disc., a foundry cupola experience 503
" " " divergencies in flange diameters 131
" " " duty trials of pumping engines 486
" " " experiments with blowers 66
" " " fit of set screws 335
" " " soft castings 339
" " " stocking and reloading coal 273
" " " Strong locomotive 632
" " " wrought iron scrap in castings 341
MCBRIDE, JAMES, disc., driven wells 328
" " " fit of set screws 336
Mechanical significance of vicosity determinations of lubricants 369
Members elected, Philadelphia meeting 10
" " Nashville " 351

PAGE
Members present, Philadelphia meeting 3
" " Nashville " 349
Membership, application for, altered 8
Memorial notices of members deceased 737
Memoranda on the performance of a compound engine 545
Metal baths for tempering steel 725
MIDDLETON, HARVEY, disc., strains in locomotive boilers 538
Milling cutters, cost of 261
Milling machine as a substitute for the planer in machine construction 259
MINOT, H. P., disc., safety car heating system 464
" " " automatic regulator for heating apparatus 441
" " " circulation in steam boilers 493
" " " inserting and securing crank pins 447
" " " molecular strains in steel 722
" " " performance of a compound engine 548
" " " river practice of the West 660
" " " rope transmissions 708
" " " strains in locomotive boilers 540
Molasses, the influence of, upon cement 287
Molecular structure of steel 716
MORGAN, C. H., disc., wrought iron scrap in castings 339
MORGAN, T. R., disc., moulds for steel castings 342
Moulds for steel castings 342

NAGLE, A. F., The best form of nozzles and diverging tubes 505
" " disc., circulation in steam boilers 492
" " " duty trials of pumping engines 486
" " " flanges for copper pipe 715
" " " molecular strains in steel 721
" " " performance of a compound engine 554
" " " punched and sheared edges of steel 733
" " " river practice of the West 655
" " " Strong locomotive 634
" " " surface condensers 429
Newberry, S. B., method of enlarging photographs 699
New method for inserting and securing crank pins 446
New method of stocking and reloading coal 270
New principle in steam piston packing 91
Nichol's experiments with condenser tubes 420
Notes on steel tested shortly after rolling 38
Notes on warming railroad cars by steam 471
Nozzles and diverging tubes, best form of 505

Overhead heating of mills 103

Packing for pipe joints 129
Packing rings of P. R. R 95
Paper friction gear 715
Paraffine to prevent corrosion 430
PARSONS, H. DE B., The influence of sugar upon cement 286
" " The displacement and the area curves of fish 679

PAGE

PARSONS, H. DE B., disc., performance of a compound engine 548
" " " piston packing 94
" " " river practice of the West 658
" " " rope transmissions 711
" " " strains in locomotive boilers 538
" " " testing the strength of cements 181
Passaic river water, analysis of 251
Perkins's viscosimeter 374
Persistent form of gear tooth, A 398
Petroleum, crude, in steam boilers 253
Photographs, large and enlarged 696
Piping for blowers 60, 503
Piping for air in glass works 64
Piping for groups of wells 324
Piston rings, breakage of 93
Piston packing, A new principle in 91
Planing of sheared steel 727
Plea for the printing press in mechanical engineering schools, A 403
PORTER, C. T., disc., an interesting indicator diagram 298
Porter's marine governor 319
POTTER, CHARLES, JR., disc., the milling machine as a substitute for the planer 265
Power required by blowers 57, 61, 63
Positive blowers 67
Power press problems 161
President's Address, 1887 23
Pressure per square inch of crossheads 374
Press problems, power 161
Pressures and velocities of air in blowers 53
Printing press, A plea for the, in mechanical engineering schools 403
Proceedings, Philadelphia (XVI) Meeting 3
Proceedings, Nashville (XVII.) Meeting 349
Proportioning steam cylinders 360
Proportions of L. V. locomotive 610
Pulleys for rope transmissions 703
Pumps, centrifugal, and their efficiencies 228
Pumps for driven wells 324
Pumping engines, duty trials of 476

Railroad bed for bridge structures 276
Railroad cars, notes on warming by steam 471
RANDOLPH, L. S., Strains in locomotive boilers 534
" " disc., a short way to keep time and cost 386
Rankine's fan 232
RAYNAL, A. H., disc., divergencies in flange diameters 131
" " " lining for brake straps 331
" " " wrought iron scrap in castings 341
Reaming of punched steel 727
Receiver, effect of 549
Record blank for indicator diagram 297
Re-entrant angles, avoidance of 540

PAGE

REESE, JACOB, disc., a plea for the printing press in engineering schools.... 411
" " automatic regulator for heating apparatus 440
" " electro-plating of steel.... 715
" " inserting and securing crank pins..... 450
" " punched and sheared edges of steel 732
" " rolling of steel 45
" " strains in locomotive boilers..... ... 541
" " wire rope fastenings..... 678
Regulator, automatic, for heating apparatus. 431
Reloading and stocking coal..... 270
Repairs of blowers 66
Report, finance committee..... 11
Report, library committee..... 12
Report of committee on uniform methods of tests 15
Report of council, VIII. annual meeting..... 8
Resistance to boats from shallow water 658
RIDGWAY, J. T., disc., kerosene oil in steam boilers 253
River practice of the West 645
Robinson process for driven wells..... 328
ROGERS, W. S., disc., electro-plating of steel..... 724
" " " large blue prints..... 700
" " " river practice of the West 657
Roller bushing for journals..... 329
Rope fastenings 671
Rope transmissions, design of 703
Rudders for stern wheel steamboats..... 650

Sack, Hugo, method of blue printing 699
Safety car heating system, A..... 453
Salisbury iron for soft castings 339
Sand in driven wells..... 325
SANGUINETTI, PERCY A., On the divergencies in flange diameters of pumps, valves, etc..... 124
Saybolt's viscosimeters.. 370
SCHEFFLER, F. A., A foundry cupola experience 496
SCHUHMANN, GEORGE, disc., experiments with blowers. 68
Section lining, Standard..... 107
SEE, HORACE, disc., rope transmissions 709
" " " estimating the cost of foundry work..... 396
" " " performance of a compound engine..... 550
" " " punched and sheared edges of steel..... 734
" " " strains in locomotive boilers..... 541
" " " Strong locomotive..... 633
" " " river practice of the West..... 659
" " " a plea for the printing press in engineering schools.... 412
Set screws, fitting of..... 333
Shaw's nozzle..... 505
Shrinkage allowance..... 448
Shrinkage of tires.... 449
Short way to keep time and cost, A 380

PAGE
Shovel, steam 515
Silber's governor 311
Silicon in steel 735
SINCLAIR, ANGUS, disc., piston packing 94
Single acting pumps for driven wells 326
SMITH, OBERLIN, power press problems 161
" " disc., piston packing 94
" " " driven wells 329
SNELL, HENRY I., experiments and experiences with blowers 51
" " an economical method of heating and ventilating an office and warehouse building 99
" " disc., a foundry cupola experience 499
" " " Strong locomotive 633
Sockets for wire rope 671
Soft castings 337
Soldering of wire rope sockets 677
SONDERICKER, JEROME (GAETANO LANZA), An investigation as to how to test the strength of cements 172
Specifications for Western steamboats 649
Speed of cable in rope transmissions 703
Speed recorder, An electric 377
Splices in rope transmissions 710
Standard section lining 107
Standard sugar solution 291
Stay bolts, fracture of 535
Steam chest diagram 296
Steam cylinders, Proportioning of 360
Steam Excavators 515
Steam heating for cars 462
Steam jackets, economy of 554
STETSON, GEO. R., disc., molecular strains in steel 719
STILES, H. C., disc., power press problems 170
Stirling castings 341
Stocking and reloading coal 270
Strohmeyer on the blue heat of steel 148
Stop motion for power presses 166
Strain, excentric, effect of 178, 181
Strains in locomotive boilers 534
Strength of cements, How to test the 172
Strong locomotive, Distribution of steam in 556
STRONG, GEORGE S., disc., piston packing 93
" " " Strong locomotive 637
Sugar, The influence of, upon cement 286
Steam piston packing, A new principle in 91
Steel, brittle under impact 152
" *car axles* 135
" castings, moulds for 342
" effect of blue heat on 47
" effect of electro-plating on 715
" molecular structure of 45

PAGE

Steel, pliable condition of 157
" seasoning of 42
" stay bolts 542
" *tests of shortly after rolling* 38
Stern wheel steamboats 647
Sugar vapor corrosion by 429
SUPLEE, H. H., disc., circulation in steam boilers 493
" " " paper friction gear 715
" " " performance of a compound engine 550
" " " punched and sheared edges of steel 730
" " " rope transmissions 707
Surface Condensers 417
Suspension bridge rope sockets 678
SWEENEY, JNO. M., River practice of the West 645
SWEET, J. E., A new principle in steam piston packing 91
" " disc., a foundry cupola experience 503
" " " a plea for the printing press in engineering schools 411
" " " an electric speed recorder 379
" " " estimating the cost of foundry work 396
" " " the milling machine as a substitute for the planer 265
" " " inserting and securing crank pins 451
" " " standard section lining 121

Tables of velocity of the air in blowers 53
Taper of wire rope sockets 678
TAYLOR, F. W., disc., divergencies in flange diameters 128
" " " steel car axles 151
Temper of steel, effect of repeated bending on 715
Tempering of steel in metal baths 725
Tension in rope transmissions 705
Tests for car axles 142
Tests of steel shortly after rolling 38
Tests of wire rope 673
Thanks, resolutions of, Philadelphia meeting 19
" " " Nashville " 356
Thermostatic regulators 432
Thimble stay bolts 542
Thorneycroft propellers 659
Throttling of piping for blowers 64
THURSTON, R. H., Internal friction in non-condensing engines 74
" " Large and enlarged photographs and blue prints 696
" " Proportioning steam cylinders 360
" " disc., centrifugal pumps 237
" " " experiments with blowers 68
" " " Strong locomotive 634
Time and cost, A short way to keep 380
Tires, shrinkage allowance for 449
Topical discussions, XVIth meeting 324
Topical discussions, XVIIth meeting 703
Toughened castings 341

PAGE

TOWNE, H. R., a safety car heating system 453
" " disc., divergencies in flange diameters 129
" " " fit of set screws 333
" " " friction of engines 88
" " " soft castings 337
" " " standard section lining 116
" " " the milling machine as a substitute for the planer 265
" " " wrought iron scrap in castings 340
Tubes, diverging, best form of 505
Tuyerage of cupolas 499

Use of kerosene oil in steam boilers 247

Valve gear of Western steamboats 647
Valve gear, Strong locomotive 557
VAN VLECK, FRANK, Standard Section Lining 107
Velocity of air in blowers 53
Ventilating an office building 99
Viscosimeters 270
Viscosity of lubricants, Significance of 369
Vortex chamber 239
Vulcanized fibre for brake straps 331

WALKER, JOHN, disc., heating and ventilating a building 104
Warm blast apparatus for cupolas 503
WARNER, W. R., disc., automatic regulator for heating apparatus 439
" " " shaft governors 321
" " " roller bushing for journals 329
" " " rope transmissions 711
Water used by Strong engine 608
Wearing of crossheads gibs 374
Wear of gears 222
WEBBER, SAMUEL, disc., friction of engines 88
WEBBER, W. O., pumps and their efficiencies 228
" " disc., divergencies in flange diameters 127
" " " steel car axles 145
WEBB, J. B., A persistent form of gear tooth 398
" " disc., friction in toothed gearing 206
" " " piston packing 93
" " " shaft governors 309
" " " the milling machine as a substitute for the planer 265
Wells, Reuben, diagrams of link motion 638
WEST, THOMAS D., disc., estimating the cost of foundry work 395
WHEELER, F. M., disc., surface condensers 427
WHITEHEAD, G. E., disc., fit of set screws 335
WHITHAM, JAY M., surface condensers 417
" " disc., circulation in steam boilers 491
" " " proportioning steam cylinders 366
WILCOX, J. F., disc., a foundry cupola experience 502
" " " large blue prints 701

PAGE

WILCOX, J. F., disc., river practice of the West..... 655
" " " strains in locomotive boilers..... 544
" " " viscosity determinations of lubricants..... 375
WILLSON, F. N., disc., standard section lining..... 117
Wire rope fastenings..... 671
WOODBURY, C. J. H., disc., heating and ventilating a building..... 102
" " " pumps for driven wells..... 326
WOOD, DEVOLSON, disc., centrifugal pumps..... 240
" " " economy of high and low speed engines..... 714
Wood for brake straps and friction gearing..... 331
WOODWARD, C. M., disc., river practice of the West..... 661
WOOLSON, O. C., A railroad bed for bridge structures..... 276
" " disc., fit of set screws..... 335
" " " piston packing.....93–95
" " " roller bushing for journals..... 330
" " " soft castings..... 338
Wrought iron scrap in castings..... 339